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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/672,753	09/28/2000	Juha Heiskala	NC17164	8018

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EXAMINER	
AHN, SAM K	

ART UNIT	PAPER NUMBER
2634	9

DATE MAILED: 12/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/672,753	HEISKALA ET AL.	
	Examiner	Art Unit	
	Sam K. Ahn	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 September 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *6*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

The Office suggests replacing "86" on p.12, line 23, with "84".

Appropriate correction is required.

Claim Objections

2. Claims 1-9 and 11-20 are objected to because of the following informalities:

In claim 1, line 11, the Office suggests deleting "--- multi-dimensional, trellis-coded modulator ---" and inserting "--- multi-dimensional trellis-coded modulator ---", wherein claims 2-5, 7-9 and 11-12 directly or indirectly depend on claim 1.

In claim 6, lines 2-3, the Office suggest deleting "longer-than-average transitions" and inserting "longer-than-average length transitions"

In claim 13, line 7, the Office suggests deleting "--- N-dimensional, trellis-coded modulator---" and inserting "--- N-dimensional trellis-coded modulator ---", wherein claims 14-17 and 19-20 directly or indirectly depend on claim 13.

In claim 18, line 3, delete "Radon-Harwitz" and insert "Radon-Hurwitz".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-9 and 11-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

   In claim 1, in lines 12-13, recites the limitation "--- a second N-dimensional transmit antenna transduced by said second transmit antenna ---". How can a transmit antenna be transduced by another transmit antenna? Please explain further as the specification does not support this limitation.

   Claims 2-9 and 11-12 directly or indirectly depend on claim 1.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 9, 10, 12 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9 recites the limitation "said multi-dimensional trellis codes" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Regarding claim 10, it appears from reading the claim that it was attempted to depend on another claim, "--- communication system of claim ---". However, it fails to further recite to which claim it is depending on. Therefore, the scope of claim 10 is unclear and indefinite.

Regarding claims 12 and 20, what version of the IEEE 802.11 standard is the claim referring to?

Assuming that 112 rejection has been overcome, the rejection is as follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 7-10, 13-16 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Alamouti (Trellis-Coded Modulation and Transmit Diversity, IEEE).

Regarding claims 1 and 13, Alamouti discloses a method and apparatus in a communication system having a sending station (see Fig.2) for sending data upon a communication channel comprising a multi-dimensional trellis-coded modulator coupled to receive indications of the data to be sent by the sending station, said multi-dimensional trellis-coded modulator for forming N-dimensional (two) trellis-encoded sequences therefrom. (see Fig.2 where the data from binary source is converted by TCM encoder and modulated) Further, a first and at least a second transmit antenna coupled to said multi-dimensional trellis-coded modulator (see Fig.1 and 2), a first and second N-dimensional sequences transduced by its corresponding transmit antenna (note Table 1, and note p.704-706), and providing orthogonal transmit diversity.

Regarding claim 7, Alamouti teaches all subject matter claimed, as applied to claim 1. Alamouti further teaches the multi-dimensional trellis-encoded modulator utilizing a Wei construction, having a multi-dimensional construction. (note Table 1, and note p.704-706)

Regarding claims 8 and 18, Alamouti teaches all subject matter claimed, as applied to claim 1 or 13. Alamouti further teaches wherein the first and second N-dimensional sequences applied to said first and second transmit antennas, respectively, comprise Radon-Hurwitz transforms, as having equivalent construction. (note Table 1, and note p.704-706)

Regarding claims 2, 9, 14 and 15, Alamouti teaches all subject matter claimed, as applied to claim 1 or 13. Alamouti further teaches encoding the data, mapping the (OFDM) multi-dimensional trellis-codes prior to modulating. (note Table 1, and note p.704-706) The Examiner assumes that claim 9, where the "said multi-dimensional trellis codes" is "said multi-dimensional trellis encoded modulator".

Regarding claims 3 and 16, Alamouti teaches all subject matter claimed, as applied to claim 2 or 15. Alamouti further teaches mapping is positioned into subsets (see Table 1) of selected minimum squared distances. (note column 2 in p.705)

Assuming claim 10 depends on claim 1, Alamouti teaches all subject matter claimed, as applied to claim 1. Furthermore, Alamouti teaches a demodulator (see Fig.3, rx chain) coupled to receive indications of the data received at the receiving station, said demodulator for demodulating the indications to form separate sequences, the separate sequences used to estimate symbol values. (note p.706-707)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 11, 12, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti (Trellis-Coded Modulation and Transmit Diversity, IEEE).

Regarding claims 11 and 19, Alamouti teaches all subject matter claimed, as applied to claim 1 or 13. The environment of Alamouti's system is related to a wireless communication system implementing trellis coded modulation and transmit diversity for the purpose of increasing coding gains As fading is a problem in any wireless communication environement, although Alamouti does not explicitly disclose using the system in a WLAN environment, it would have been obvious to one skilled in the art at the time of invention to implement in any environment with fading problems, as Alamouti's system pursues to overcome the problem. A method or apparatus capable of overcoming a fading problem or having an advantage of having a coding gain, one skilled in the art would be motivated to implement the same method or apparatus in any other environment, where Fig.2 may be viewed as an access point, such as WLAN for the purpose of overcoming the same problem and having the same advantage.

Regarding claims 12 and 20, Alamouti teaches all subject matter claimed, as applied to claim 11 or 19. Although Alamouti does not explicitly disclose the data

communicated by said first and second transmit antennas communicating at a rate specified by IEEE 802.11 standard, it is inherent that the system functions as recited since the standard is mainly for WLAN, it would have been obvious to one skilled in the art to communicate at the specific rate for the purpose of effectively transmitting and receiving data, otherwise, the system would not operate seamlessly with other systems operating under the same standard.

7. Claims 4 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti (Trellis-Coded Modulation and Transmit Diversity, IEEE) in view of Wei ('209).

Regarding claims 4 and 17, Alamouti teaches all subject matter claimed, as applied to claim 1. However, Alamouti does not explicitly teach a rule of correspondence in a convolutional encoding, wherein intrasubset and intersubset is implemented. Wei teaches, in the same field of endeavor, trellis modulation implementing intrasubset and intersubset and as a result minimizes time diversity in the multidimensional trellis code. (note col.2, lines 17-54) Therefore, it would have been obvious to one skilled in the art at the time of invention to add an interleaver with intrasubset and intersubset for the purpose of reducing time diversity, as taught by Wei, and improve overall performance of the system.

Allowable Subject Matter

8. Claims 5 and 6 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, and claim objection set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: Present application discloses a multi-dimensional trellis-encoded modulation in a transmitter where a first dimensional sequence is transmitted through a first antenna, while a second dimensional sequence is transmitted through a second antenna. As a result, maintains spectral efficiency and improve error rate performance. Closest prior art, Alamouti, teaches in the same field of endeavor, all subject matter recited. Wei, another close art, teaches interleaving data following a rule of correspondence by implementing a intersubset and intrasubset. Howevr, Alamouti nor Wei teaches or suggests the teaching of defining intersubset transitions to shorter-than-average length transitions or defining intrasubset transitions to longer-than-average length transitions. Therefore, prior art do not teach or suggest all the limitation claimed.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Raleigh et al. and Alamouti et al. teach trellis modulation in a transmitter with antenna array.

Wei teaches apparatus and method of multi-dimensional trellis encoded modulation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Sam Ahn** whose telephone number is **(703) 305-0754**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Stephen Chin**, can be reached at **(703) 305-4714**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

P.O. Box 1450

Alexandria, VA 22313-1450

or faxed to:

(703) 872-9306

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Sam K. Ahn
11/26/03

YOUNG T. TSE
PRIMARY EXAMINER